



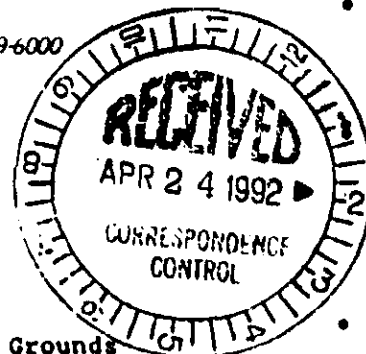
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

February 18, 1992

Mr. Cliff Clark
Low-Level Burial Grounds Unit Manager
U.S. Department of Energy
P.O. Box 550
Richland, Washington 99352

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FEDERAL FACILITIES



RE: Notice of Deficiency for the Low-Level Burial Grounds
Dangerous Waste Permit Application

Dear Mr. Clark:

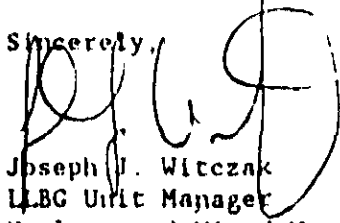
15239 We have reviewed your Low-Level Burial Grounds Notice of Deficiency Response Table dated July 26, 1991. Enclosure 1 of this letter identifies the comments with which Ecology concurs. Enclosure 2 contains additional discussion on some of our previous comments as well as new comments on both Supplement 2, Design Documents, and the Construction Quality Assurance Plan for this project. Enclosure 3 is Ecology's Construction Inspection Policy for this unit.

The enclosed comments should be addressed and a response forwarded to our office by April 30, 1992. Your response should consist of a revised NOD response table.

Per your request, this letter also serves as notification that the Low-Level Burial Grounds are an interim status unit. Therefore, the lined, mixed waste trench discussed in this application can be constructed prior to the issuance of a Dangerous Waste Permit. However, use of the trench will be contingent upon our approval of the final design and construction documents. Once we are in agreement with these documents, we will provide you a letter supporting the initiation of construction regardless of permit issuance status.

Please contact me at (206) 438-7557 with any questions.

Sincerely,


Joseph J. Witczak
LLBG Unit Manager
Nuclear and Mixed Waste Management

Enclosures

cc: Dave Jansen (Ecology)
Dave Nylander (Ecology)
Dan Duncan (EPA)
Sue Price (WHC)
T. Veneziano (WHC)



ENCLOSURE 1

Low-Level Burial Ground NOD Comments with Ecology Concurrence

1-13, 17-20, 22-30, 32-101, 104, 105, 107, 108, 110-118, 121, 123, 125-127, 129-136, 139-
142, 148-150, 152-156, 158-160, 162-164, 166-168, 170, 173-178, 180-184, 186-190, 192-
198, 200-205, 207, 209, 211, 214, 215, 217-221, 223, 224, 227-231, 233-235, 237, 238, 242-
244, 246-251, 254, 255, 257, 259, 260

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ENCLOSURE 2

NOD Comments for the Low-Level Burial Grounds

No. Comment

- 14 Comment: Section 4.1.2.1, Test for Free Liquids, Page 4-3

The response indicates that the presence of free liquids is determined by real time radiography. The response also indicates that this method is not effective in shipments where lead shielding is used. The information in Appendix 4A indicates that a large percentage of shipments received at the Low-Level Burial Grounds have contained lead. Provide an estimate of the percentage of shipments which will contain lead and therefore cannot be accurately assessed for the presence of liquids. Estimate the percentage of shipments which will be assessed by real time radiography.

- 15 Deficiency: Section 4.6.1, List of Wastes, Page 4-4

The response indicates that the requested information is "already listed in Appendix 4A". However, Ecology has requested the following information which is not listed in Appendix 4A: 1) a list of all waste received after November 23, 1987, 2) the "specific areas of the existing unlined trenches" which have received mixed waste, and 3) identification of the trench locations where liquids have been disposed.

Requirement: As noted in the last NOD, concurrence with this response will be based upon the additional information to be submitted. This information should be provided as soon as possible to facilitate our evaluation. In addition, information similar to that provided in Appendix 4A should be provided on all waste received after November 23, 1987, not just the waste that Energy/WHC consider to be mixed waste. Also note that comment 15 was erroneously listed in the last NOD as having Ecology concurrence. Concurrence is now withdrawn pending submittal and review of the requested information.

- 16 Deficiency: Section 4.6.2.1, Exemption Based on Existing, Pg 4-5

The response fails to address Ecology's requirements. These requirements are: 1) specify the portions of each trench which did not contain wastes on November 23, 1987, and 2) edit the term "notification of" to "approval from".

Requirement: The requested information must be provided and a commitment made to make the specified text corrections. It should also be noted that Federal Register language addressing HSWA defined differences between existing, new, replacement, and lateral expansion units (see July 15, 1985 Federal Register).

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- 21 Comment: Section 4.6.3.4, Liner Exposure Prevention, Page 4-14

Although covering the side slopes with an earthen cover should be adequate for short term protection, the erosional forces present on the Hanford Reservation will most likely thin this layer over a period of time. Precipitation and wind erosion will distribute this cover material to the toe of the slope. Discuss or reference the text which address the methods for determining the extent of such erosion over time.

- 31 Comment: Sections 4.6.5.3.3 and 4.6.6.6.1, Weight of Overlying Material and Stability of Drainage Layers, Pages 4-36 and 4-47

It is unclear if the last line of text in this response means that material test results will be submitted to Ecology "as requested" in the future or "as requested" in the NOD comment. It should be noted that all "Certified Material Test Reports" and similar material documents must be provided to Ecology. This is a permit requirement which must automatically be met without future requests from Ecology staff.

- 102 Deficiency: Section 11.1.1.2, Removal or Decontamination, Page 11-22

It is unsatisfactory to only address extremely hazardous waste (EHW) in this soil sampling plan. The plan should address all known dangerous/hazardous constituents.

Requirement: Replace the phrase "extremely hazardous waste (EHW)" with "hazardous constituents".

- 103 Comment: Section 11.1.4.1, Retrievably Stored TRU Waste, Page 11-25

The report "Corrosion in Waste Drums from the 183-H Solar Evaporation Basin Cleanout Project" (WHC-IP-0716) states that "A significant accelerating factor was the high ambient temperature and direct sun exposure of the failed drums." and "...the cyclic temperatures experienced could lead to condensation of moisture inside the drums, lowering the pH and accelerating corrosion." Although Ecology recognizes that the climate alone did not result in the breached drums, it is evident that the unprotected storage of dangerous waste drums in the Hanford environment should not be taken for granted. No further comment is necessary.

- 106 Comment: Section 11.1.5.2.1, General Description, Page 11-29

Although the response does not address the grade requirement specified in this comment, Ecology has located and concurs with the grade requirement found elsewhere in the application. No further comment is required.

- 109 Comment: Section 11.1.5.2.2.6, Drainage Layer, Page 11-52

Comment 106 also applies here.

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- 119 Comment: Section 2.1.1, Hanford Site, Page 2-4

Ecology is aware of DOE-RL's position on the regulation of radionuclides. However, our response to this position and further discussion on this issue will be addressed on a site-wide basis and not in this permit. Delete the sentence beginning on line 12.

- 120 Comment: Section 2.1.2.1, Past Practices, Page 2-6

In lieu of the proposed text addition, the text proposed in the response to comment 126 should be used here.

- 122 Deficiency: Section 2.1.2.1, Past Practices, Page 2-11

The fact that the trenches were backfilled before the effective date of mixed waste regulations has no bearing on how the trenches are regulated. The relevant fact is whether the trench continued accepting mixed waste.

Requirement: Delete the term "received mixed waste and were backfilled before" and insert "discontinued receiving mixed waste prior to".

- 124 Comment: Section 2.1.2.3, Closure, Page 2-22

This comment will not be concurred with until after receipt of the revised drawings. These drawings should be provided as soon as possible because the overall permitting and closure strategy will be based upon this information.

- 128 Comment: Section 3.1.2, Containerized Waste, Page 3-4

The Performance Assessment must be provided to Ecology when available.

- 137 Comment: Table 3-2, Analytical Methodology, Page 3-17

There is no "9045" ASTM procedure. However there is an SW-846 Method 9045 which is considered equivalent to Ecology's procedure for determining the pH of a solid. Reference to SW-846 Method 9045 is an acceptable text change.

- 138 Deficiency: Section 3.2.9, Additional Requirements, Page 3-20

Annual audits of each generator are insufficient for waste verification of off-site generators.

Requirement: The waste verification program must include the physical/chemical verification of 10% of the waste received in each shipment transported to the site from non-Hanford generators.

- 143 Comment: Section 4.6.2.2, Exemption Based on Design, Page 4-5

This comment must be addressed in the next NOD Response Table.

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- 144 Deficiency: Section 4.6.3, Liner System, General Items, Page 4-6

WAC 173-303-610(7)(b) allows Ecology to set postclosure durations of any length based upon site conditions. Although a 30-year timeframe can be used to estimate future requirements, Ecology cannot specify the postclosure duration at this time.

Requirement: Delete the term "30-year".

- 145 Comment: Figure 4-1, RCRA Compliant Liner System, Page 4-7/8

Appropriate text changes need to be made within the permit application to specify asphaltic concrete. Are the truck staging and unloading areas within the lined part of the landfill? If so, what type of compatibility testing has been done on this material?

- 146 Deficiency: Section 4.6.3.1.2, Primary Liner System, Page 4-11

Ecology's basis for requiring 4H:1V slopes is to reduce the possibility of potential failures. This could be done by requiring higher factors of safety (FS) for slope stability analysis. However, requiring flatter slopes provides additional assurance against failure which are not an input to the theoretical calculations used to produce the FS. As an example, an FS could be increased for a slope by flattening the slope or by using a material with a higher friction angle. Although each parameter could be adjusted to yield the same FS, flattening the slope actually produces a system less likely to fail because the flatter slope is easier to install from both a soil and synthetic liner point of view.

It should also be noted that one of biggest problems with multi-layer liner systems is the complexity and cost of repairing failures. Should a slope failure of such a system occur, the possibility exists that the entire liner system may have to be replaced. In addition, breach of the liner may result in a release of hazardous constituents to the environment. Therefore, Ecology considers it critical to design multi-layer systems with a higher factor of safety (measurable or not) than for a non-barrier or readily replaceable component.

The definitive design report (Section 5.1) states "a static factor of safety of 1.5 and a dynamic factor of safety of 1.1 is considered adequate". Not only does Ecology disagree with these values, Ecology also finds disagreement in using a separate FS for static versus dynamic conditions. It is our opinion that an FS of 2.0 is appropriate for both conditions. The reported FS values for the critical interface (geotextile-sand) are 1.75 (static) and 1.25 (dynamic). Neither values meet our recommended standard and are uncomfortably close to the design document standards. There appears to be little room for error during installation, product manufacture, and unforeseen/unusual combinations of failure mechanisms. The FS determination is based upon data generated under pristine laboratory conditions on a small fraction of the material to be used. The liner system will not be installed in a similar environment. Furthermore, it is not evident if the laboratory tests

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which produced the shear strength parameters were based upon the actual materials to be used for this project. This has been the cause of failure in other, similar systems where these parameters were taken from a text resource or based on "similar", not actual materials.

Requirement: It is Ecology's understanding that part of the reluctance to change the trench side slopes is the added cost to re-design this facility. Although we appreciate that concern, it cannot interfere with Ecology's responsibility to ensure protection of human health and the environment. However, given the fact that these slopes are not permanent, that this project is a landfill (as opposed to a surface impoundment), and will be filled (loaded) in a manner which minimizes additional stress, Ecology may allow the use of 3H:1V trench slopes if: 1) a dynamic and static factor of safety equal to or greater than 2 can be achieved or an acceptable justification for using a static FS of 1.5 and a dynamic FS of 1.1 is provided (such a justification should include the reasons for using a different FS for static versus dynamic), 2) an evaluation is provided of the materials used for testing versus those to be installed, and 4) a statement is added to the text stating Ecology's preference for an FS-2 and a 4H:1V slope along with Energy's recognition that a slope failure may prohibit further use of the landfill if Ecology does not accept the repair work of a failed slope.

147 Comment: Section 4.6.4.4.4, Stability of Slopes, Page 4-39

This issue is addressed in comment 146. No response is necessary.

151 Deficiency: Section 4.6.5.5, Soil Liners, Page 4-39

It is Ecology's experience that "the great deal of latitude for the Contractor (or Construction Manager) to determine the most suitable types of equipment and procedures for preparing and placing the admix liner" has been a key problem at the LERF site. Another problem has been the sampling and field test procedures utilized at LERF.

Requirement: Ecology highly recommends that the Contractor's flexibility be limited wherever possible. If Energy, WHC, or Kaiser are aware of a successful procedure or piece of equipment, it should be specified to the Contractor. If not, the requirement for the Contractor to submit a description of these activities should be augmented by a requirement to have the submittal approved by the WHC Project Engineer and the CQA Engineer. These submittals must also be approved by Ecology's construction inspector or unit manager.

157 Comment: Section 4.6.6.1.1, Primary System, Page 4-44

The text should be edited to reflect the response.

161 Deficiency: Section 4.6.6.5, System Compatibility, Page 4-47

There is insufficient data in the two references listed in the response to assess the fingerprinting program.

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Requirement: A discussion of the fingerprinting program must be presented in the text. It should include a list of the parameters for each synthetic material which have been analyzed, the reported values, and tolerances for acceptance of future shipments of synthetic material to be used for this project.

165 Comment: Chapter 5, Groundwater

All laboratory results submitted to Ecology must be accompanied by a qualitative report which discusses the findings and draws conclusions. The revised Chapter 5 must include: 1) updates of all maps, including the plume migration maps, 2) new cross-sections based on information from 1990-91 well reports, and 3) a commitment to prepare an annual data evaluation report (with validated data) of water quality for 1991, 1992, and 1993, and 4) the criteria to be used in assessing compliance based upon the reports in item 3.

169 Deficiency: Section 5.2.3.2.3, Results of Water Quality, Page 5-26

The statement that elevated chromium concentrations are due to well construction practices is not supported by evidence currently under review by Ecology.

Requirement: The conclusion drawn in the response must be supported by sampling results which indicate that chromium and other elevated constituent concentrations have dissipated within a year of well installation.

171 Deficiency: Section 5.3.4, Regional Hydrogeology, Page 5-38

It is insufficient to provide only text discussion concerning the semiconfining silts and clays.

Requirement: The locations of the semiconfined aquifer must be shown on the map and cross-sections should be included based on information gained from 1991 well report information.

172 Comment: Section 5.3.4, Regional Hydrogeology, Page 5-39

Recharge rate variation within the 200 Areas must be plotted on a map.

179 Deficiency: Section 5.3.5.2.4, Vadose Zone, Page 5-57

The Monitoring Efficiency Model only models efficiency and is therefore not adequate for representing the vertical distribution of contaminants in various stratigraphic units.

Requirement: The computer models PORFLO-3 and VAM-2D should be used to make the assessment of pollution migration. A characterization of the vadose zone should be completed prior to developing a vadose zone monitoring plan. This vadose zone monitoring plan must be part of the permit application.

- 185 Comment: Sections 5.4.2 and 5.4.4, Travel Time From 200 West and Summary of Travel, Page 5-70

Aquifer tests must be completed and the results compared to travel times given in the text.

- 191 Deficiency: Section 5.5.2.1.1, Background, Page 5-84

New data from RCRA-compliant wells is absent. Furthermore, pollutants classified as "sinkers" may be present for long periods of time in the middle of the aquifer as they migrate downwards from the upper part of the aquifer.

Requirement: The new data regarding the lithology of Waste Management Areas 3, 4, and 5 must be included to provide updated evidence of pollutant distribution in the soil column. In addition, a portion of the monitoring wells must be screened to monitor the middle section of the aquifer and soil testing must be conducted to establish if pollutants are distributed throughout the saturated zone.

- 199 Comment: Table 5-12, Well Installation Priority, Page 5-127

Ecology will give final approval of the monitoring network after the revised plan is reviewed.

- 206 Deficiency: Section 7.4.6, Treatment, Storage, or Disposal, Page 7-32

Ecology's concern in this comment is the handling of spill or emergency related residue material. WAC 173-303-340 does not fully address this issue.

Requirement: The text must be revised to indicate that WAC 173-303 requirements will be met in handling releases and release residues.

- 208 Deficiency: Section 11.1.4.3, Gas Sampling, Page 11-27

Because the gas sampling tubes are already in place, monitoring of the emissions, or lack of emissions, from these sampling points should continue.

Requirement: An ambient air sampling monitoring plan should be developed and indicate points of monitoring, constituents to be assessed, sampling protocols to be used and the frequency of monitoring.

- 210 Comment: Section 11.1.5.2.1, General Description, Page 11-30

The extent of each landfill cover is still under consideration by Ecology and will be based, in part, on the new drawings to be provided in response to comment 124. Ecology requires 4H:1V slopes and a factor of safety of 2.0 for the cover. (See comment 146)

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- 212 Deficiency: Section 11.1.5.2.2.1, Native Soil Grade Layer, Page 11-48

The response fails to address the comment's requirement for Ecology approval on the test pad plan.

Requirement: The text must indicate that this plan must receive Ecology approval before construction of the pad can commence.

- 213 Deficiency: Section 11.1.5.2.2.3, Soil/Bentonite Layer, Page 11-49

It is not possible for on-site diskings to allow the precise degree of control of bentonite and moisture percentage that pugmilling will afford. Furthermore, diskings on the side slopes will be difficult with currently available tractor-harrow combinations. This is a critical liner which needs as much control as possible. Choosing to disk the admix would also require additional test pads to prove this method is equivalent to the pugmill method.

Requirement: The soil/bentonite material must be mixed in a pugmill. In addition, Ecology's remarks on contractor flexibility in comment 151 should be noted here.

- 214 Comment: Section 11.1.5.2.2.9, Vegetative Cover, Page 11-54

Concurrence will be based upon the results of the comprehensive search.

- 222 Comment: Section 11.1.5.5.1, Cover Drainage, Page 11-60

Measuring the amount of cover drainage can be easily accomplished and may provide data which supports or refutes use of the HELP model and the cover design. This issue was discussed and agreed to for the design of the 183-H Basins final cover. No permit limits will be set nor chemical analysis required for the runoff.

- 225 Deficiency: Section 11.1.6, Schedule for Closure, Page 11-68

Concurrence will be assessed after Ecology reviews the outcome of this evaluation.

- 226 Deficiency: Section 11.2.1.2, Erosion Damage, Page 11-77

Precipitation is not the only cause of settlement.

Requirement: Surveying must initially be conducted quarterly. If early results show no significant settlement, annual surveys will be sufficient with Ecology concurrence.

- 232 Comment: Section 12.3, Transporter Requirements, Page 12-6

Details of transportation requirements required by Ecology can be found in the facility-wide permit application.

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- 236 Deficiency: Appendix 4A, List of Mixed Waste, Pages 4A-18,38, 44

Figure 2-9 must be edited to support the response. In addition, the report "Corrosion in Waste Drums from the 183-H Solar Evaporation Basin Cleanout Project" (WHC-IP-0716) indicates that 3,230 drums were sent to Trench 24 in Burial Ground 218-W-04C and 1,990 drums were sent to Trench 5 in Burial Ground 218-W-3AE. These drums are not all listed in this appendix, nor does the Toxic Name assigned to the drums appear accurate.

Requirement: The response must indicate where these 5220 drums are located and justify the Toxic Name assigned to the drums.

- 239 Comment: Appendix 4F, Liner Material Specifications, Page 4F-1

Ecology is aware of at least two geomembrane manufacturer's who supply HDPE products with melt flow indices (MFI) of much less than 1.1 grams per 10 minutes. A technical document supplied by one of the manufacturer's listed a MFI of 0.22 grams per 10 minutes as a "typically good" product. A compilation of "typical values reported by geomembrane manufacturers" must be provided.

- 240 Comment: Appendix 4F, Liner Material Specifications, Page 4F-2

Does the response imply that the specifications will be used in lieu of this appendix? If so, this appendix should be removed from the next revision of this document. If not, the text must be revised to address Ecology's original comment.

- 241 Comment: Appendix 4F, Liner Material Specifications, Table 4F-1

Does the response imply that the specifications will be used in lieu of this appendix? If so, this appendix should be removed from the next revision of this document. If not, the text must be revised to address Ecology's original comment. This comment applies to all the original comments addressing this appendix.

- 245 Comment: Appendix 4F, Liner Material Specifications, Page 4F-20

Previous comments address these same issues. No further comment necessary.

- 252 Deficiency: Appendix 4F, Liner Material Specifications, Page 4F-44

The response does not address preconstruction meetings and problem/work meetings.

Requirement: These two meetings must also be included in the response for Ecology notification requirements. This comment also applies to the meetings listed in Section 2.2 of the CQA Plan.

253 Comment: Appendix 4F, Liner Material Specifications, Page 4F-49

It should be noted that Ecology, in most cases, can concur with ECN/NCR's within 8 hours. However, there will be changes and deviations which require a detailed review and cannot be turned around in 8 hours. If Ecology expects a longer review, the appropriate individuals will be informed as such. The DOE-RL/WHC response should be incorporated into the permit application.

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The following comments refer to Supplement 1 of the LLBG permit application,
Request for Exemption from Lined Trench Requirements.

256 Comment: Section 2.3.2, Long-Term Migration, Page 2-8

This comment must be addressed in the next NOD Response Table.

258 Comment: Section 4.1, Waste Characteristics, Page 4-1

The response should be incorporated into the text.

261 Comment: App 5A, Conceptual Design of Cathodic Protection, Page 5A-1

This comment must be addressed in the next NOD Response Table.

262 Comment: App 5A, Conceptual Design of Cathodic Protection

This comment must be addressed in the next NOD Response Table.

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The following comments refer to documents located in Supplement 2 of the LLBG
Permit Application, Design Documents.

SITE INVESTIGATION REPORT

263 Deficiency: Section 4, Field Exploration, Page 4

Only one geotechnical boring for the investigation appears to have been drilled near the landfill, this boring is located approximately 60 feet north of the proposed limit of the landfill. In addition, only 5 of the 12 test pits were excavated within the footprint of the landfill. Maximum test pit excavation depths were 17 feet. With the landfill excavation being about 30 feet, the sufficiency of field exploration cannot be adequately made.

Requirement: A supplemental field exploration plan must be developed and submitted to Ecology for approval. Upon approval, this plan must be executed to provide the information needed to assess the proposed landfill closure.

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DEFINITIVE DESIGN REPORT

- 264 Comment: Section 4.2, Laboratory Testing, Page 7

Testing did not include any analyses of in situ soil strength parameters. The calculations use in situ soil strength. Without this information, the appropriateness of the values used cannot be adequately made. See comment 263.

- 265 Deficiency: Section 4.2.2, Geosynthetics Interface Testing, Page 8

Textured HDPE for geosynthetic interface testing was supplied by Gundle Lining Systems, Inc. The specified geosynthetic will be supplied by SLT. The texturing of these two materials is produced by different manufacturing methods. Their interface friction angles with adjacent materials are not necessarily equal.

Requirement: Additional interface friction testing should be performed for all the interfaces using the exact materials, both geosynthetic and soil, specified in the construction documents.

- 266 Comment: Section 5.3.3, Desiccation Cracks, Page 11

As stated in EPA's *Requirements for Hazardous Waste Landfill Design, Construction, and Closure*, the composite secondary liner system should out perform either geomembranes or soil based liners alone. When a geomembrane is placed directly on top of a soil based liner and sealed up against its upper surface, leachate moving down through a hole or defect in the geomembrane does not spread out between the geomembrane and soil based liner.

The geomembrane must be placed on top of the admix liner such that leachate does not spread along the interface of the geomembrane and admix liner and move downward through the entire area of the admix liner. A geomembrane placed on highly permeable portions of the admix liner (areas with 1-inch deep, 1/4-inch wide desiccation cracks), would allow leachate to move through a defect in the geomembrane, spread over a large area of the admix liner and percolate down as if the geomembrane was not there.

Requirement: The design report and specifications must require that the admix surface is wetted just prior to geomembrane placement to minimize the amount of desiccation cracks. This would be a more appropriate response to providing the best possible seal between the admix liner and geomembrane than adding an additional 1-inch of thickness to the admix liner.

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- 267 Deficiency: Section 5.5.1, Geotextile Selection Analyses, Page 15

As stated in Appendix C, gradient ratio testing should be performed for all soil-to-geotextile interfaces where the geotextile will act as a filter. This includes the operations layer over geotextile, drainage layer over geotextile and admixed layer over geotextile interfaces. This test is to confirm that the actual soil material with the actual geotextile selected for the job will perform as modeled in the calculations.

Requirement: Perform gradient ratio testing for the three soil/geotextile interfaces shown in the construction drawings.

- 268 Deficiency: Section 5.6.2, Earth Loading - Primary Slope Riser Pipe, Page 17

The primary and secondary slope's riser pipes are inferred as being the same for calculating purposes. The secondary slopes riser pipe is perforated and therefore may deflect more than the primary slope riser pipe.

Requirement: A separate calculation should be provided for the expected deflection of the secondary slope riser pipe.

- 269 Deficiency: Section 6.4.1, Leachate Removal Pumps, Pages 23-25

No discussion was found relative to the possibility of flammable gas generation in this disposal facility. It is unclear how likely this possibility may be and whether the proposed design is reasonable without special provisions for the pumps (e.g. intrinsically safe controls).

Requirement: Provide information to support proposed pump design regarding flammable gas potential.

- 270 Deficiency: Section 6.4.1.1.1, Low Capacity Submersible Pump, Page 24

Based on a telephone conversation with the Grundfos pump manufacturer, the selected pump model (5N03-9) is not available. For similar leachate pump flow/head conditions, the manufacturer's application engineer recommended pump model 5E5. This model has 304 stainless steel and teflon coated internal parts instead of 316 stainless steel construction.

It was stated that "the foot valve on this pump will be removed so that leachate in the riser pipe can drain back into the sump and will not be subject to freezing." The term foot valve is not applicable to a submersible pump. There is an internal check valve in the pump which prevents the discharge line from draining back through the pump. In conversation with the pump manufacturer, all submersible pumps would have this check valve (it is not optional). Efforts to defeat this check valve are certainly not recommended by the manufacturer, would void pump warranty and may cause pump damage if operated without this check valve.

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It is normal design practice to maintain a full discharge line from a pump such that the pump starts up against an elevation head. No information was found in the design calculations to indicate that operation of this pump under startup conditions (no head) or running conditions (5 gpm +/-, 50 feet of head +/-) was reasonable.

Requirement: Select a pump which meets the intended design operating conditions and which is available. Consider alternate freeze protection of the discharge line and maintain a full discharge line or evaluate alternate means of draining the discharge line.

- 271 Comment: Section 6.4.1.2, Secondary System Pump, Page 24

See comment 270.

- 272 Deficiency: Section 6.4.4.2 Tank Design, Page 27

No discussion was provided on the construction inspection, leak testing or certifying of the tank and components as required in WAC 173-303-640.

Requirement: Discuss or reference the section within the permit application which addresses compliance with WAC 173-303-640.

- 273 Deficiency: Section 6.4.4.4 Tank Leak Containment System, Page 28

No discussion was provided concerning the requirement that the tank secondary leak containment system will be pumped dry within 24 hours whenever water accumulates (WAC 173-303-640(4)(c)(iv)).

Requirement: The text must be edited or the appropriate citation given to demonstrate compliance with this regulation.

- 274 Deficiency: Section 6.4.5.2, Control, Operation and Maintenance, Page 29

A response action plan (RAP) will have to be prepared for the landfill. The RAP will have a section that contains criteria on what is a rapid and large leak (RLL) and the action leakage rate (ALR) for the leak detection layer. A discussion on the requirements for RAPs is contained in EPA report *Requirements for Hazardous Waste Landfill Design, Construction, and Closure*, 1989 Chapter 10.

With no separate flow measuring device for the secondary leak detection layer, the quantity of leachate removed cannot be assessed with the pump in the "auto" mode of operation. This will not allow determination of compliance with the RAP.

Requirement: A Response Action Plan must be included with the permit application. The secondary pumps must be operated manually with the primary pumps shut down so the quantity of leachate removed can be recorded or provide a separate flow meter for the secondary leak detection layer.

275 Comment: Section 6.6, Facility Filling Plan, Page 30

The facility filling plan calls for three single layers of barrels with each layer covered with a 1- to 2-foot soil layer. Questions concerning this filling plan are presented below:

- Will the soil layer and drums support equipment driven over them?
- Will the barrels be driven down into the operations layer?
- What is an irregularly shaped burial box?
- When driven on will this irregular shaped box be driven down into the operations layer or crushed?
- How will the operations layer be placed to prevent consolidation and slumping of the overlying 1- to 2-foot soil layer?

The description of how waste will be disposed of should be described in greater detail to assess whether or not waste placement may cause a failure of the primary liner and leachate collection system.

276 Deficiency: Section 6.7, Electrical Service and Lighting, Page 31

There is no mention of the reliability of the electrical system which will supply power to the leachate removal pumps. Lengthy electrical service interruption may result in more than 12 inches of leachate on the liner and flooding of the high capacity pump.

Requirement: Provide information to indicate that electrical supply system reliability is high [data on the frequency and duration of power outages (last 10 years) for the power supply system in proximity to the proposed facility (State of Washington Department of Ecology, *Criteria For Sewage Works Design*, 1985, pg. 44 and 255)]. Subject to this information, an on-site emergency power supply for the pumping system (including alarms and level controls) may be necessary.

277 Comment: Section 7.1, Period of Operations, Page 32

The 30-year post-closure monitoring time frame is the only post-closure time mentioned in the regulations. However, the EPA notes that if the waste in the landfill is still hazardous after 30 years monitoring will continue. Post-closure monitoring may continue at low level radioactive landfills for 100 years or more (EPA, *Requirements For Hazardous Waste Landfill Design, Construction, and Closure*, 1989, page 113). See comment 144.

- 278 Deficiency: C.1, Surface Water Hydrology/HELP Model, Pages 150 through 196 of 397

No calculation was provided to show that the drainage layer permeability is 1 cm/sec. If the drainage layer permeability changes then flow through the drainage layer and maximum head on the primary liner could be different.

Requirement: Provide calculations that support the input value used.

- 279 Deficiency: C.3, Primary Leachate Collection System, Page 214 of 397

The leachate collection pipe at the toe of the 3H:1V slope most likely will not collect all the leachate that passes by the pipe because of the trench design. Leachate will flow through the geonet under the pipe and the 1/4-inch holes at 12 inches on-center most likely will not collect all the leachate in the drainage material.

Requirement: Calculate flow passing by the leachate collection pipes at the toe of the slope and verify that less than 12 inches of head will be on the liner.

- 280 Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 223 of 397

No extra surcharge load was added to active earth pressure acting on the wall. Maintenance trucks and possibly leachate tanker trucks will park along side the concrete wall.

Requirement: Add surcharge load from trucks to active earth pressure and then reexamine reinforcing.

- 281 Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 224 of 397

No reinforcing for the tank footing was selected.

Requirement: Select reinforcing for tank footing.

- 282 Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 224 of 397

The lap splice length of 12 inches for the vertical reinforcing into the horizontal slab was not calculated. Based on our calculations, the lap splice should be longer.

Requirement: The lap splice length calculations must be provided.

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- 283 Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 225 of 397

The discussion indicates that cracking of the secondary containment systems concrete should occur. External liners are to be free of cracks and gaps (WAC 173-303-640(4)(e)(i)(C)).

Requirement: The design of the concrete slab under the tank footings should be reexamined to ensure that cracking of secondary containment system is minimized. In addition, the maximum width of allowable cracks must be specified.

- 284 Deficiency: C.6, Vertical Riser Pipe Foundation-Structural Design, 242 of 397

The load the vertical riser pipe places on its 6-foot-square foundation with a 32-inch-diameter hole in the middle is calculated to be 6.85 kips. This exceeds the allowable bearing capacity of the sand layer for rectangular footings of 6.4 kips in calculation C.14 Bearing Capacity of Liner Soils.

Requirement: Redesign footing so that less than 6.4 kips is applied to sand layer.

- 285 Deficiency: C.7, Sump Design, Page 248 of 397

No calculation was provided concerning clogging potential of 3/4-inch diameter holes in the leachate collection well by the sump gravel. Refer to Bass, Jeffrey, et. al., *Avoid Failures of Leachate Collection and Cap Drainage Systems*, Pollution Technology Review No. 138, for design guidance.

Requirement: Provide the calculations justifying design.

- 286 Deficiency: C.21, Earth Loading Primary Slope Riser Pipe, 334 of 397

The calculations do not consider the effects of the 2-inch HDPE pipes under the haunches of the slope riser pipes.

Requirement: Revise calculations to take into account the 2-inch HDPE pipes under the haunches of the 8-inch HDPE slope riser pipes or relocate the 2-inch HDPE pipes.

- 287 Deficiency: C.25, Geotextile Selection, Page 368 of 397

The maximum height which the soil containing 4-inch rock can be dropped onto the geotextile without damaging the geotextile is a concern.

Requirement: Provide calculations that state the allowable height that each of the soil layers overlying geotextiles can be dropped without damaging the geotextiles and describe placement method.

DRAWINGS

- 288 Deficiency: H-2-131577, Operations Layer Contours

The leachate truck loading area should be defined and the method of controlling spills detailed (WAC 173-303-665(2)(a)(i)(C)). A system similar to the truck unloading area would be appropriate.

Requirement: Locate the leachate truck loading area and provide spill control details as appropriate.

- 289 Deficiency: H-2-131577, Operations Layer Contours

The "D" drain pipe (leachate collection piping) system needs a way to be cleaned out.

Requirement: Show locations and details of "D" drain pipe system cleanouts.

- 290 Deficiency: H-2-131577, Operations Layer Contours

Control for the location of the "D" drain pipe at the top of the slope is not provided. There are no dimensions in the details or control points provided.

Requirement: The drawing must illustrate these items.

- 291 Comment: H-2-131579, Liner System Details, Detail 5

The limits of the general fill and the operations layer is not clear. The drawing should be revised.

- 292 Comment: H-2-131581, Sump Cross-Sections, Section H

The excavated trench for the secondary slope riser pipe is shown to have vertical side walls with 90 degree corners at the bottom and top which the geomembrane must bend around. The 60 mil HDPE geomembrane is not sufficiently flexible to bend at the corners. When the sand backfill is placed around the pipe, the pressure will force the HDPE into the bottom corners, thereby placing additional stress on the HDPE liner material at the bottom and top corners. This is not necessary and could be resolved by cutting the trench sidewalls back to a maximum slope of 1H:1V. A means to alleviate this problem must be provided.

- 293 Deficiency: H-2-131581, Sump Cross-Sections, Section H

The sensor pipes under the haunches of the slope riser pipes will not allow for proper compaction under the haunches of either pipe, which could result in over 5 percent deflection of the pipes.

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Requirement: The sensor pipes should be repositioned so they are not under the haunches of the slope riser pipes would allow for good compaction and reduce deflection. See comment 286.

- 294 Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8

A detail is needed to show what is required at the end of the primary slope riser pipe and primary leachate collection pipes. Provide connection details to the leachate collection well and pump location information.

The top of the vertical riser pipe is at elevation 686.9 feet in this detail. Drawing H-2-131588 indicates that top of waste contours will be at elevation 691 feet, 4 feet above the top of the vertical riser pipe. The plan for the extension of the vertical riser pipe should be described in the Definitive Design Report and included in the O & M.

- 295 Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8

It would seem prudent to add a bentonite mat under the primary liner in the sump area. This is a critical location as over 12 inches of leachate can pond there at times. This would be relatively low cost and may prevent a small defect in the primary liner from adding significant quantities of leachate to the leak detection layer.

- 296 Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8

Intake velocity is typically about 3.5 fps to avoid problems with head loss and cavitation. The design intake velocity is 15 fps. A larger intake (4 inches) is recommended to reduce intake velocity.

- 297 Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 11

The 3 x 3 x 3/8 inch angle should be as a radius angle. A description similar to the call out on the Primary Leachate Self Priming Pump Plan View on drawing H-2-131586 would be useful.

- 298 Deficiency: H-2-131583, Side Slope and Vertical Riser Pipes, Detail 15

The reinforcing should have a 3-inch clearance from bottom of footing and 1-1/2-inch clearance from top of footing according to the UBC. See comment 284.

Requirement: Revise detail to meet the requirements of the UBC.

- 299 Deficiency: H-2-131584, Truck Staging Area and Access Ramp, Detail 16

The truck staging area grading plan (southwest corner) will allow water to runoff onto unlined areas. All areas exposed or that could be exposed to waste should be lined (WAC 173-303-665(2)(a)).

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Requirement: Revise grading plan or use other methods to control runoff.

- 300 Deficiency: H-2-131584, Truck Staging Area and Access Ramp, Detail 35

The drain line under the staging area should have a way to be cleaned out (WAC 173-303-665(3)).

Requirement: Provide the location and details for the drain line cleanout.

- 301 Comment: H-2-131584, Truck Staging Area and Access Ramp, Section C

There is no design justification of the 2-foot drop of the geosynthetics on the uphill side of the ramp. Comment 292 also applies. Provide justification or re-design.

- 302 Deficiency: H-2-131585, Leachate Collection and Tank Piping, Section J

The 3-inch line from the high capacity pump does not have secondary containment from the edge of the liner to the temporary leachate storage tanks secondary containment system, as required by WAC 173-303-640(4)(f).

Requirement: Provide secondary containment of the 3-inch line.

- 303 Comment: H-2-131585, Leachate Collection and Tank Piping, Section J

The width of the tank footing must be called out.

- 304 Deficiency: H-2-131585, Leachate Collection and Tank Piping, Section K

The drawings show the tank being supported on 2 legs. Calculation C.4 used a continuous strip for analyzing the load applied to the footing.

Requirement: Redesign tank support to apply a continuous load to the tank footing or analyze and design reinforcement for point loads from the temporary leachate storage tank.

- 305 Deficiency: H-2-131585, Leachate Collection and Tank Piping, Section K

No detail was provided on how the tank footing is to be attached to the slab.

Requirement: Provide detail on how the tank footing will be attached to the slab.

- 306 Deficiency: H-2-131585, Leachate Collection and Tank Piping, Detail 23

No corner bar detail was provided for the horizontal reinforcement.

Requirement: Provide horizontal corner bar detail.

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307 Comment: H-2-131585, Leachate Collection and Tank Piping, Detail 23

The cleaning of the horizontal slab construction joints prior to pouring the vertical wall was not discussed. This cleaning will help to ensure a good bond between the vertical wall and horizontal slab.

308 Comment: H-2-131586, Sump Pump Details, Section L

The spacing of the expansion anchors must be called out.

309 Deficiency: H-2-131586, Sump Pump Details, Section L

No specification was provided or called out on the drawings for the grating that the self priming pump is attached to.

Requirement: Provide grating specification or call out selected grating on the drawings.

310 Comment: H-2-131586, Sump Pump Details, Detail 33

An enclosure should be provided over the opening for the high capacity discharge pipe in the cover plate to prevent debris from entering the pump station.

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SPECIFICATIONS

- 311 Comment: Section 01300, Geosynthetics Submittal, Part 1-11. C, Page 01300-9

Interface friction testing, gradient ratio testing, drainage layer and sump gravel permeability, geonet testing and geocomposite testing should be included with the quality control certificates required.

All the geosynthetic testing noted above except gradient ratio testing will be performed as part of the CQA activities. Gradient ratio testing should still be performed, especially on the admix liner to geotextile interface.

- 312 Comment: Section 02220, General Excavation and Backfill, Part 2-1A, Page 02220-2

The requirements for general fill are too broad. The section should be modified to say "... and as approved by the Owner or CQA Engineer."

- 313 Comment: Section 02220, General Excavation and Backfill, Part 3-6.F, Page 02220-5

There is no discussion about proofrolling and testing in Part 3-1, Clearing and Grubbing. Such a discussion should be provided.

- 314 Comment: Section 02220, General Excavation and Backfill, Part 3-7, Page 02220-5

See comment 313.

- 315 Deficiency: Section 02222, Trenching and Backfilling, Part 2-5, Page 02222-2

Secondary side slope trench compaction requirements should be at least hand compacted to assure there are no voids under the slope riser pipe.

Requirement: Revise the table to require at least hand compaction of soil under riser pipe.

- 316 Comment: Section 02224, Admix Production, Placement, Compaction, and Trimming, Part 3-3, Test Fill, Page 02224-4

The following should be added to the last sentence in paragraph C, "and placement/compaction is equal to that used on the test fill."

- 317 Comment: Section 02224, Placement and Compaction, Part 3-5.B, Page 02224-4

This section requires that the admix be compacted at a moisture content of 1 to 5 percent over optimum. Part 3-2 says the admix should be prepared at 0 to 5 percent over optimum. These requirements must be made consistent.

- 318 Comment: Section 02224, Admix Production, Placement, Compaction, and Trimming, Part 3-5.H, Placement and Compaction, Page 02224-4

Paragraph H should be amended to require fully penetrating pads for the pegfoot or padfoot roller compactor in all lifts above the first lift of admix material. After compaction of the horizontal lifts, a disk harrow should be used to rough the face prior to placing the next lift. This will allow the interface between lifts to be fully mixed which would reduce the possibility of leachate travelling horizontally at lift interfaces.

- 319 Comment: Section 02224, Admix Production Placement, Compaction, and Trimming, Page 02224-4

Comment 266 also applies here.

- 320 Comment: Section 02226, Granular Drainage Layers, Part 2-1, Page 02226-1

The specifications require mechanically stable and chemically inert material. If this is a critical item, performance testing should be added to the specifications.

- 321 Deficiency: Section 02226, Granular Drainage Layers, Parts 2-1 and 2-2, Page 02226-2

Part B to the drainage layer gravel and sump gravel sections require that the "material shall exhibit a permeability of 1×10^{-2} cm/sec or greater." Calculation C.26, Estimated Permeabilities of Drainage Gravels uses a formula to determine permeability that is not applicable to the specified gravel and further recommends laboratory permeability testing for verification.

Requirement: Permeability testing of the drainage layer and sump gravel must be performed. This requirement should also be added to Section 01300.

- 322 Deficiency: Section 02226, Granular Drainage Layers, Part 3-1, Page 02226-3

The proposed compaction methods to be used around the leachate collection pipes in the pipe strength calculations (C.22) were not incorporated into the placement section.

Requirement: Add a section on placement and compaction of drainage layer gravel around the leachate collection piping consistent with design assumptions.

- 323 Deficiency: Section 02228, Operations Layer, Part 2-1, Operations Layer Material, Page 02228-1

The materials specification does not assure that the assumptions for the operations layer grain size distribution analyses used in design calculation for the Type A geotextile are met. See calculation C.25, Geotextile Selection.

Requirement: A requirement for the operations layer grain size should be specified which is consistent with the grain size assumed in the calculations. Gradient ratio testing should also be required for the actual materials submitted for the project as stated in the design calculations.

- 324 Deficiency: Section 02275, Geosynthetics, Part 2-1, Geomembrane Liner, Page 02275-4

The table containing the geomembrane properties required does not contain requirements for the interface friction angle of the geomembranes with the adjacent soil or geosynthetic materials.

Requirement: Add interface friction requirements to the properties specified.

- 325 Deficiency: Section 02275, Geosynthetics, Part 2-1.C.4, Conformance Testing, Page 02275-7

Interface friction testing should be added to the list of tests to be performed on the geomembrane in Section a and the test procedure indicated in Section b.

Requirement: Include the appropriate interface friction testing information.

- 326 Deficiency: Section 02275, Geosynthetics, Part 2-2.C, Conformance Testing, Page 02275-11

Specific geocomposite tests are identified but no minimum requirements are provided in the specifications.

Requirement: Include the required physical properties of the geocomposite in the appropriate section of these specifications.

- 327 Comment: Section 02275, Geosynthetics, Part 2-2.C, Conformance Testing, Page 02275-11

The transmissivity testing of the geonet and geocomposite should be run at the gradients used in the landfill and at the expected overburden

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pressure. The gradients at the landfill are 0.33 for the side slopes and 0.025 for the bottom slope. The overburden pressure is 120 pounds per cubic foot times 35-feet-thick for a pressure of 29 psi on the geonet. We recommend considering using a slightly higher overburden pressure to be conservative.

- 328 Comment: Section 02275, Geosynthetics, Part 2-2.D, Transportation, Handling and Storage, Page 02275-12

Based on a telephone conversation with the geonet manufacturer, the nominal transmissivity of 7.2 gallons per minute per foot can not be met at the hydraulic gradient and compressive stress called out in the table. The appropriate specification should be determined and the impacted calculations must be re-run.

- 329 Comment: Section 02275, Geosynthetics, Part 2-2.B, Transportation, Handling and Storage, Page 02275-13

The apparent opening size (AOS) for geotextiles Type A and B in the table does not agree with the manufacturer's literature. AOS is typically called out in U.S. standard sieve or millimeters. Please comment.

- 330 Comment: Section 02275, Geosynthetics, Part 2-1.1, Geomembrane Liners, Page 02275-15

The third paragraph in section C states that the geosynthetic layer shall be anchored with a maximum 6-inch thick lift of compacted soil in the anchor trench. The plans indicate that this is a 6-inch minimum requirement. It is not clear if the 6-inch dimension is a minimum or maximum requirement. Please clarify.

- 331 Comment: Section 02275, Geosynthetics, Part 3-1.B.9, Nondestructive Seam Continuity Testing, Page 02275-22

The word "fabricator" should be replaced with the word "installer" in the first sentence of section a). A fabricator is not necessary with HDPE geomembrane installation. The installer is usually the onsite entity responsible for NDT.

Also, the last sentence in section a) allows rewelding of seams that do not pass nondestructive testing. Rewelding of seams may increase the possibility of stress cracking and is not recommended. Industry standard is to typically patch areas that do not pass nondestructive testing.

- 332 Comment: Section 02275, Geosynthetics, Part 3-1.B.13, Repair Procedures, Page 02275-28

Repair procedures allow grinding and rewelding of small sections of extruded seams which need repair. Rewelding of seams is not recommended due to the increased potential for stress cracking.

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- 333 Deficiency: Section 02275, Geosynthetics, Part F-1, Granular Materials, Page 02275-30

Motor graders are rubber tired vehicles, can weigh as much as 60,000 pounds and have tire pressures in excess of 60 psi. A D-3 tractor weighs about 17,000 pounds and applies about 5 psi ground pressure.

Requirement: Specify what is an allowable motor grader weight and tire pressure and supply calculations supporting your conclusion or allow motor graders to operate on no less than 3 feet of material over any geosynthetic layer.

- 334 Deficiency: Section 02275, Geosynthetics, Part 3-2.C.4, Placement of Soil Materials, Page 02275-35

See comment number 287.

Requirement: The maximum height which the overlying soil can be dropped on the geotextiles without damaging or a placement method must be specified.

- 335 Deficiency: Section 02511, Truck Unloading Area Surfacing, Part 2, Products, Page 02511-2

No top course material specification is provided as called out in Section 02220-2.2.

Requirement: Provide top course material specification.

- 336 Comment: Section 02511, Truck Unloading Area Surfacing, Parts 2 and 3, Pages 02511-2 and 3

No references to sub-base appear on the construction drawings. In Part 2-4, a reference to Section 02200 is confusing since no Section 02200 exists. Part 3 has two separate and different subsections on sub-base execution.

- 337 Comment: Section 02720, Drainage Facilities Part 3-1, Page 02720-1

Referenced work for 23rd Street drainage ditch improvements was not found on the drawings. Please provide.

- 338 Comment: Section 02727, Vertical Riser Pipe, Part 2-1.B, Page 02727-1

The reference to "coating for the lower portion of the riser pipe as shown on the drawings" is not consistent with other references. The drawings relate coating requirements for the entire riser pipe to Section 09900. Section 09900, part 3-4.A.2a, requires "all concrete within the landfill" be coated. This should be clarified.

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- 339 Deficiency: Section 03310, Structural Concrete, Part 3-5.E, Inspection and Testing, Page 03310-7

WAC 173-303-640(4)(e)(i)(C) requires that external liners be free of cracks and gaps.

Requirement: Concrete for the secondary containment should be inspected for cracks and gaps after placement and after filling of the temporary leachate storage tank. A repair procedure should be specified.

- 340 Comment: Section 11210, Leachate Pumps, General

There is no indication that spare pumps will be obtained for this facility. It is highly recommended that at least one spare pump of each type be provided and available for O & M personnel. Thus, immediate replacement of a failed pump can be performed to maintain satisfactory and timely leachate removal in accordance with stated design requirements.

- 341 Comment: Section 11210, Leachate Pumps, Part 2-1, Submersible Sump Pumps, Page 11210-1

The Grundfos pump manufacturer recommended that a "flow inducer sleeve" be provided on each submersible pump installed in a horizontal position to ensure adequate cooling of the motor and avoid premature motor failure. The manufacturer should be consulted to establish specific sleeve requirements. Comment 270 also applies here.

- 342 Deficiency: Section 13205, Leachate Temporary Storage Tank, Part 3-2, Inspection, Page 13205-2

WAC 173-303-640 requires that tanks and ancillary equipment be tested after installation and certified.

Requirement: Provide in specifications and CQA Plan a method to test, inspect and certify the tank after installation.

- 343 Comment: Section 13340, Pump Controls, General

There is no indication as to how "pump on" and "pump off" levels will be set for the submersible primary and secondary leachate removal pumps. The "pump off" level will need to be set above these pumps to avoid a run-dry condition (re: potential motor overheating/burnout and airlock problems). Possible design changes may be needed to accommodate the above while still satisfying the Definitive Design Report criteria stated in Section 6.4.1.

It is recommended that a "high water" alarm condition be sensed in the primary leachate collection system because of the potential flooding of the high capacity pump (State of Washington, Department of Ecology, *Criteria For Sewage Works Design*, 1985, P.39).

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Unless an emergency power source is provided, it is recommended that a "power failure" alarm also be provided since all leachate removal depends on electrically operated pumps.

- 344 Deficiency: Section 13340, Pump Controls, Part 3-4, Float Switches, Page 13340-9

The pump off float switch in the leachate collection well is specified to be set such that the pump turns off when the leachate level is 1-inch deep. This conflicts with the drawings which show the bottom of the pump suction 2 inches above the floor of the collection well.

Requirement: The pump off level should be set to eliminate (or minimize) any pump cavitation in accordance with manufacturer recommendations. Minimum depth for correct float operation should be considered.

- 345 Deficiency: Section 15060, Pipe and Pipe Fittings, Part 3-1, Acceptance, Page 15060-4

The test procedure outlined does not state the duration of the pressure testing, whether makeup water for hydrostatic pressure testing is allowed, and total allowable test time at the test pressure.

Requirement: A more complete specification for pressure testing the solid wall HDPE pipe should be provided.

LINER/LEACHATE COMPATIBILITY TEST PLAN

346 Comment: General

Ecology has recently been provided a copy of a new compatibility test plan (WHC-SD-W025-TRP-001). Does the new plan completely replace the plan provided as Document 7 to Supplement 2 for the LLBG Permit Application or will it be added as an additional document to the application? The following comments are based upon the first compatibility test plan. However, they should also be assessed against the new report. It is Ecology's understanding that a polypropylene geotextile will be used instead of a polyester geotextile and that the compatibility test results from the Grout project to support a polypropylene geotextile will be used. This change must be noted in the permit application. In addition, fingerprint data of the Grout-tested geotextile must be compared with the geotextile to be used at the LLBG to ensure the Grout Method 9090 results are transferrable.

347 Deficiency: Leachate, Page 6

Appendix B of the Plan lists the constituents found in mixed waste within the time frame of November 1986 to September 1989. This list is used to formulate the synthetic leachate. The Plan states that only components present at levels greater than or equal to 0.01% will be used to produce the synthetic leachate. Only including compounds present at a level greater 0.01% seems inappropriate.

Requirement: Provide a discussion of the reasons for choosing 0.01% as the cut-off level.

348 Comment: Leachate, Page 7

"The source leachate . . . will be . . . analyzed using standard approved organic² and inorganic^{3,4} analytical procedures" The footnotes list the analytical procedures using a numbering system contained in a Pacific Northwest Laboratory document (Vol 7 of PNL-MS-597).

Requirement: The EPA method number corresponding to the PNL number must be provided.

349 Comment: Sample Immersion Tests, Page 13

The size of the stainless steel tanks should be provided in the report.

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350 Deficiency: Sample Immersion Tests, Page 13

"The containers will be fitted with loose-fitting lids to prevent over pressurization during heating and still minimize evaporation." Method 9090 calls for a sealed lid to prevent evaporation. In addition, the pressure inside and outside the tank must be the same. These two requirements necessitate a sealed lid combined with a condenser.

351 Comment: Sample Immersion Tests, Page 13

The Plan does not state that the leachate in the tanks will be stirred. This is a requirement of method 9090.

352 Comment: Radiation Testing, Page 14

Information regarding typical radionuclides and activities in the waste is not included. This data should be included with the list of chemicals in Appendix 8.

353 Comment: Sample Handling, Page 15

The Plan does not discuss the procedure for storing the samples once they are removed from the exposure cells.

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The following comments refer to the Construction Quality Assurance Plan for
LLBG Non-Drag-Off Mixed Waste Trench (WHC-SD-W025-PLN-001).

354 Comment: General

Ecology's construction oversight of this project is outlined in the Construction Inspection Policy found in Enclosure 3 of this NOD. The policy itself will not be part of the permit but will instead be referenced in the permit. The application must contain a statement that the requirements of Ecology's CIP will be met. It should also be noted that Ecology may require videotaped footage or may tape their own footage of certain construction activities.

355 Comment: Section 1.1, Purpose, Page 5 of 112

Please provide Ecology with a copy of the Quality Assurance Program Plan (QAPP) that was prepared for this project.

356 Deficiency: Section 2.1.5.6, Consultants/Subcontractor, Page 9 of 112

The condition for the CQA personnel to coordinate with the surveyor to measure the depth and slope of various landfill components proved to be an unsuccessful means for the LERF project in verifying the design requirements are met.

Requirement: CQA personnel should use a level to check for themselves that depth and slope requirements are met. In addition, a survey report should be prepared to document the thickness and grade of each lift.

357 Comment: Section 2.2.1, Pre-Construction Meeting, Page 10 of 112

An additional topic to be added to this list is the overall project schedule.

358 Comment: Section 4.3.1, Excavation, Backfilling, and Grading, Page 17 of 112

Comment 356 also applies here.

359 Comment: Section 4.3.2, Admix Soil Liner, Page 18 of 112

According to the Definitive Design Report and specifications, the admix liner soil is coming from on-site and will be amended with bentonite. Unless there has been a change in admix liner criteria, it would be beneficial to rewrite these paragraphs to directly reflect the use of on-site materials. In addition, bentonite swell testing should be conducted on the raw bentonite materials. A description of the swell test to be used must also be provided.

360 Comment: Section 4.3.2, Admix Soil Liner, Page 18 of 112

As discussed in other comments, the admix must be prepared in a pugmill. Therefore, the Material Inspection program must require moisture content and soil/bentonite percentage tests to be carried out during the mixing operation to separate rejected material.

361 Comment: Section 4.3.2, Admix Soil Liner, Test Fill, Pages 19, 20 and 21 of 112

It appears that only one test fill (pad) will be constructed for the Non-Drag-Off facility. But there will be two different slopes at the facility, at 2.5 percent bottom slope and 3H:1V side slope. The contractor is given a choice on how to construct the side slope either parallel to the slope or horizontal to the slope. The test fill should be done in a similar manner as full-scale construction.

If the contractor elects to build the side slopes in horizontal lifts then one test fill which is fairly flat would be appropriate. If the contractor elects to build the side slopes in lifts parallel to the slope, then another test fill must be built at a 3H:1V side slope. This will allow the contractor and CQA Engineer to determine if different construction methods and construction material would result in different slopes at the landfill.

The test fill section should be amended to note that if the contractor elects to build the admix liner parallel to the side slopes, a second test fill will be required. The second test fill should be tested, monitored and inspected the same as the first test fill.

How will repaired liner sections be tested to ensure repaired sections equal or exceed the performance of other liner sections?

What method(s) will be used to collect undisturbed samples?

362 Comment: Section 4.3.2, Admix Soil Liner, Page 21 of 112

The number and frequency of field and laboratory tests to be conducted during the test fill must be changed as follows: field in-place density (rubber balloon) - 1 for every lift (minimum); laboratory permeability test - 1 for every lift (minimum); field in-place permeability test (sealed double-ring infiltrometer) - 1 after completion. The other tests listed here should remain the same. The procedures for conducting the sealed double-ring infiltrometer test must be added to the text.

363 Comment: Section 4.3.2, Admix Soil Liner, Page 21 of 112

The fourth bullet in the Construction section should be edited to read "...are discarded or reduced in size;"

The last bullet on this page should be removed as it is applicable to in-place mixing. The admix for this project will be mixed in a pugmill.

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- 364 Deficiency: Section 4.3.2, Admix Soil Liner, Page 22 of 112

Desiccation cracking is caused by drying below optimum moisture. Smooth rolling this material is treating the symptom, not the cause. Rolling the surface will not be acceptable.

Requirement: Water must be applied to the surface if desiccation cracking is evident. See comment 266.

- 365 Deficiency: Section 4.3.2, Admix Soil Liner, Page 22 of 112

A sheepsfoot roller cannot be used to scarify the surface of each lift since the lift should be compacted to the point the sheepsfoot roller walks out of the soil. Therefore, this roller will not scarify the face.

Requirement: A disk harrow must be used to scarify the surface.

- 366 Comment: Section 4.3.2, Admix Soil Liner, Construction, Page 22 of 112

When the undisturbed soil liner samples are collected, it is recommended that at least one should be from the side slope and one should be from a corner. These are the areas that are most likely to fail due to the difficulties of operating compaction equipment.

If a nuclear gauge is not used for field density testing, what method will be used and what will be the backup method?

- 367 Deficiency: Section 4.3.2, Admix Soil Liner, Page 23 of 112

It is not practical to remedy incorrect moisture content through scarifying, moisture conditioning and recompaction in the hot, dry climate at the Hanford Reservation.

Requirement: The soil must be removed, moisture adjusted, and then replaced and recompacted.

- 368 Comment: Section 4.3.2, Admix Soil Liner, Page 24 of 112

Comment 356 also applies here and to the first paragraphs of page 25 of 112 and page 27 of 112.

- 369 Comment: Section 4.3.3, Gravel Drainage Layers Construction, Page 24 of 112

The CQA inspector should also observe the placement and compaction of gravel drainage materials around piping and the leachate collection sump.

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- 370 Comment: Section 4.3.5, Anchor Trench/Side Slope Riser Pipe Trench, Page 26 of 112

There is no mention of the side slope riser pipe trench in this section other than in the title. Since soil placement and compaction around piping is different than for an anchor trench, CQA requirements should be identified for the side slope riser pipe trench also.

- 371 Comment: Section 4.3.6, Asphalt, Page 27 of 112

Insert "stockpiling and" after the word "during" in the second bullet of this section. Insert "mixing and " after the word "concrete" in the third bullet of this section. The text should also indicate that sub-base grading, layout and compaction must be verified prior to placement of the asphalt concrete.

- 372 Comment: Section 4.3.7, Concrete, Page 27 of 112

Insert "and reinforcing steel" after the word "formwork" in the second bullet of this section.

- 373 Comment: Section 4.3.7, Concrete, Pages 27 and 28 of 112

Where the concrete will be utilized as a liner, there is no mention of inspection for cracks and gaps as required in the regulations. See comments 283 and 339.

- 374 Comment: Section 4.4.1.1, HDPE Manufacture, Page 29 of 112

The manufacturer should also provide recommended repair procedures.

- 375 Comment: Section 4.4.1.2, Receiving, Inspection, and Conformance Testing, Page 30 of 112

Paragraph 5 on this page must be edited to read "Rolls of geomembrane which do not meet or exceed..."

- 376 Comment: Section 4.4.1.2, Receiving, Inspection and Conformance Testing, Page 32 of 112

The Geomembrane Contractor should be defined (manufacturer, fabricator, installer, etc.).

- 377 Comment: Section 4.4.1.5, Bedding Layer, Page 32 of 112

The geomembrane bedding layer is not to have sharp changes in grade but design drawings have some trenches with vertical walls and 90 degree corners. We agree that sharp changes in grade should be avoided. See comment 292.

This section reads a little differently than the specification. For clarity, the specification and CQA Plan should read the same, otherwise

the contractor and CQA personnel could be confused as to which requirement is to be followed.

- 378 Comment: Section 4.4.2.2, Field Seaming of Geosynthetics, Pages 33 through 36 of 112

The specifications and CQA Plan description on when the "master seamer" is to be present do not agree. The specification and CQA Plan should read the same to avoid confusion.

The CQA Plan gives the Project Manager the right not to accept seaming personnel to work at the site if their qualifications are insufficient. The specification does not contain this requirement. The specification and CQA Plan should read the same to avoid confusion.

The test seam the CQA Plan requires is at least two-feet-long by one-foot wide. The specification test seam is at least three-feet-long by one-foot-wide. The specification and CQA Plan should read the same to avoid confusion.

- 379 Comment: Section 4.4.2.5, Repairs, Pages 37 and 40 of 112

The section contains information different from the specification. To avoid conflicting information, the CQA Plan and the specification should read the same to avoid confusion. See comments 331 and 332.

- 380 Comment: Section 4.4.2.6, Materials in Contact with Geomembrane, Page 40 of 112

This section contains information that is not the same as the specification. The CQA Plan and the specification should read the same to avoid confusion. See comment 333.

- 381 Comment: Section 4.5.1, Pre-Construction, Page 42 of 112

Who is the CQA consultant? This individual or organization was not described in the personnel requirements section. In addition, the manufacturer should submit their recommended installation, repair, and testing procedures.

- 382 Comment: Section 4.5.2.2, Geotextile, Geocomposite, and Geonet, Page 45 of 112

Wide strip (width) tensile test on the geotextiles was not included in the specifications. Wide strip tensile test should be included in the specification and the minimum physical property requirement specified.

Transmissivity testing of the geonet was not included in the list. This item should be included since it will be tested for according to the specification. Mass per unit area testing on the geonet was not included in the specification but should be along with the minimum physical property requirement.

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- 383 Deficiency: Section 4.6, Temporary Leachate Collection Tank and Associated Features, Page 48 of 112

No discussion was provided on the construction inspection, leak testing or certifying of the tank and components as required in WAC 173-303-640. See comments 272 and 342.

Requirement: Provide a more complete discussion on construction inspection, leak testing and certifying of the temporary leachate collection tank and associated features to meet the requirements of the regulations. In addition, the requirement for the manufacturer to submit certifications and shop drawings should be noted in this plan.

- 384 Comment: Section 4.8, Electrical System and Pump Controls, Page 50 of 112

The qualifications and experience records of the installer's key personnel must be submitted by the installer.

- 385 Comment: Appendix A, Section 02224, Admix Production, Placement, Compaction and Trimming, Page 63 and 64 of 112

The specifications require that the Solignum sand fill admix products have no rocks larger than 1-inch-diameter. The table says there is no acceptance criteria applicable for grain size distribution. The table should be amended to refer the CQA inspector to the correct section in the specifications.

Bentonite yield in the specification requires a bentonite with a minimum yield of 125 barrels. The CQA Plan requires a minimum yield of 91 barrels. The proper bentonite yield should be selected and the CQA Plan or specification amended.

Equipment types, speed of equipment, number of passes, and special construction methods should be added to the Pre-Placement Mixing section, Test Fill Construction section, and Soil Liner Construction section. These are important items and by adding them will remind the CQA inspectors and contractor to document and use this information.

- 386 Comment: Appendix A, Section 02226, Granular Drainage Layers, Page 66 of 112

According to the specifications and design drawings, these layers are to be surveyed and should be included as an item in the table.

- 387 Comment: Appendix A, Section 02228, Operations Layer, Page 68 of 112

According to the specifications and design drawings, the operations layer is surveyed and should be included as an item in the table.

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- 388 Comment: Appendix A, Section 02275, Geosynthetics, Page 69 and 73 of 112

Thickness testing, ASTM D 1593, was called out differently than in the specification. The specification used ASTM D 750. The method shown on the manufacturer's data sheet is ASTM D 1593.

Review the thickness test methods called out and select the appropriate method for this job. Then amend the specification or CQA Plan to list the correct test method.

Geotextile conformance testing did not include mass per unit area ASTM D 3766 and wide strip (width) tensile test ASTM D 4595. These tests should be included in the list. See comment 382.

Geonet conformance testing did not include mass per unit area ASTM D 3776C. This test should be included in the list. See comment 382.

- 389 Comment: Appendix A, Sections 03100, 03210, 03310, Concrete Formwork, Reinforcing Steel, Structural Concrete, Page 78 of 112

Checking for cracks and gaps in the temporary leachate collection tanks concrete liner should be added. See comments 282, 220 and 382

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RADIOACTIVE MIXED WASTE LAND DISPOSAL FACILITY
NON-DRAG-OFF
DEPARTMENT OF ECOLOGY
CONSTRUCTION INSPECTION POLICY
-CIP-

1.0 INTRODUCTION

1.1 Purpose of this CIP (ref CQA Plan 1.1)

This Policy will describe the procedure of inspection adopted by Ecology engineers, in conjunction with the assigned DOE/WHC/GAI/KEH CQA Officers to ensure conformance with all approved design specifications, procedures, and drawings.

1.2 Participants in Policy (ref CQA Plan 2.1.2 & 2.1.5.4)

In addition to Ecology Inspection Engineers and the assigned CQA Engineer (and his/her site reps) of GAI, all KEH Construction Firm and Sub-Contractors' senior site staff will implement the inspection procedure of this Policy in conjunction with the CQA Plan of GAI.

1.3 Construction Progress (ref CQA Plan 2.2)

Every other weekly construction progress meeting will be held at Ecology offices between Ecology Inspection Engineer and the regular attenders.

The purpose of these meetings will be to broadly evaluate the progress of site works and achievements, exchange views of newly emerging construction problems or obstacles, subsequent schedules and plans, ECNs, ICNs, and inspection procedure-related problems, if any come up.

2.0 GENERAL INSPECTION ACTIVITIES (ref CQA Plan 4.0 & 4.1)

2.1 All inspections, tests and sampling procedures shall be conducted to ensure the execution of construction activities in accordance with the standards listed in the following references:

1. EPA Technical Guidance Document "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities", EPA 1986.
2. Washington Administrative Code (WAC) 173-303.

2.2 The results of all site and off site tests and examinations will be verified by the assigned CQA Officer of GAI and submitted to Ecology Inspection Engineer for review.

2.3 CQA-KEH will submit the results of all destructive/nondestructive tests to the Ecology Inspection Engineer for review prior to commencement of activities affected by these test results.

2.4 CQA-GAI will submit their material verification reports to Ecology Inspection Engineer for review.

2.5 Ecology Inspector Engineer will request any testing equipment to be re-calibrated if he/she notices inconsistent test results. This request shall be put in writing to the CQA Engineer.

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3.0 SPECIFIC INSPECTION ACTIVITIES

3.1 Foundation and Backfill (ref CQA Plan 4.3.1)

After the removal of the silty sand top layer a notification form shall be submitted by CQA-KEH site staff to the Ecology Inspection Engineer to verify the grade levels prior to commencement of basin excavations. Also, the Ecology Inspection Engineer will inspect the excavated material designated to be used in the construction of the roadway top course and for structural backfill.

3.1.1 Land Survey Inspection (ref CQA Plan 4.3.1)

The CQA Officer shall submit the survey reports received from the registered professional land surveyor designated to this jobsite to Ecology Inspection Engineer prior to the commencement of consequent activities dependent on such reports. In general, survey reports shall be attached to all notification forms involving soil or membrane placement activities. The Ecology Inspection Engineer will request to carry out/observe random survey activities.

3.1.2 Structural Backfill

* Ecology Inspection Engineer will examine the structural backfill material as it is delivered to the jobsite and immediately prior to placement.

* In addition to the visual observation, Ecology Inspection Engineer will review the following documents generated by the CQA Engineer:

- The Contractor's "earthworks operation plan and schedule"
- Test reports of all tests run on the potential materials for the structural backfill.

3.1.3 Foundation Level Materials

Ecology Inspection Engineer will visually check the foundation materials immediately before placement of structural backfill. All results of the compaction and moisture tests carried out in the specified frequencies and locations shall be attached to the notification forms submitted for consecutive soil layers prior to placement of new layers.

3.2 Low-Permeability Admix Soil Liner (ref CQA Plan 4.3.2)

3.2.1 Materials:

* Ecology Inspection Engineer will examine the soil prior to placement, and give approval to use examined stock piles.

* CQA Officer/personnel will submit soil test results to Ecology prior to mixing.

* Soil mixing will be observed by Ecology Inspection Engineer, and the results of the specified tests attached to the notification form submitted prior to placement.

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3.2.2

Soil Placement

- * Ecology will observe placement, spreading and compaction operations of the liner material.
- * Results of compaction and moisture content tests shall be attached to the notification form submitted by CQA Officer/personnel to Ecology prior to placement of consecutive lifts.
- * CQA Officer/personnel will submit a notification form after completion of placement of the low permeability liner to check for the following before placement of any protective membrane:
 - defects,
 - surface smoothness,
 - elevations.

3.2.3

Test Fill

- * Since the Test Fill will be constructed primarily to simulate construction of the actual facility, using the same equipment and construction methods to achieve the specified properties, it is the intent for the Ecology Department Engineers to observe up this operation as closely as possible.
- * All the relevant records and test results will be made available for review by Ecology engineers.
- * Ecology Engineer will be promptly notified by the Project Engineer of the commencement date of any construction or testing activity on the Test Fill.
- * Prior to the placement of the Soil Admix, Ecology will review the survey report for the set up of the Test Fill to verify the dimensions.
- * In addition to the field and lab tests listed in Appendix A of the CQA Plan, an SDRI (Sealed Double Ring Infiltrometer) in situ permeability test will be started, in accordance with (ASTM D 5093 through 5099) developed by Stephen Trautwein, on each of the Test Fills constructed. Test records will be kept for the SDRI to verify the achievement of the specified maximum permeability.
- * The CQA Officer will provide Ecology with the Test Reports of the SDRI on a regular basis for the period from the start of the test until the final completion of the Project.

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3.3 HDPE Geomembrane Liner (ref CQA Plan 4.4)

3.3.1 Material Verification (ref CQA Plan 4.4.1)

CQA Officer/personnel will submit to Ecology all the specified documents referring to the supply of the geomembrane including:

- manufacturer's qualifications
- manufacturer's quality control plan
- manufacturer's certified material test reports
- CQA's reports on membrane and resin tests.

3.3.2 Installation (ref CQA Plan 4.4.2)

3.3.2.1 * CQA Officer/personnel will submit to Ecology all the specified documents concerning the installation of the membrane liners including:

- installers' qualifications
- installation drawings
- repair recommendations
- report on recommended seam welding, testing and sampling procedures.

3.3.2.2 * CQA Officer/personnel will submit to Ecology Inspection Engineer a notification form for the installation of the geomembrane, and attach with it copies of the Certified Material Test Reports, to check the following before approval to proceed with installation of the membrane:

- smoothness and cleanliness of surfaces

3.3.2.3 * Ecology Inspection Engineer will observe the following activities during installation:

- placement of material relevant to drawings
- preparation of seaming
- sampling procedures relevant to specifications
- repairs
- anchorage of material
- nondestructive seam testing.

3.4 Drainage Net (ref CQA Plan 4.5.2.2)

CQA Officer/personnel will submit a notification form to the Ecology Inspection Engineer, and attach with it the test data reports of all the specified sampling and testing of the material to be used. The Inspection Engineer will observe the following during the placement of the Net:

- placement and anchorage relevant to specs and drawings
- usage of sound material
- sampling in accordance with specifications

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3.5

Geotextile and Geocomposite

- * CQA Officer/personnel will submit a notification form to the Ecology Inspection Engineer, and attach with it the test results reports of all the specified sampling and testing of the material to be used. The following will be provided to Ecology prior to installation:
 - method and drawings of installation
 - installers' qualifications
 - method of overlapping/seaming and repair
 - manufacturer's certified material test reports
- * Ecology Inspection Engineer will observe the following during the placement of the Geotextile material:
 - placement relevant to specs and drawings
 - usage of sound material
 - sampling in accordance with specifications

3.6

Leachate Collection System (ref CQA Plan 4.5)

3.6.1

Drainage Gravel (ref CQA Plan 4.5.2.1)

- * CQA Officer/personnel will submit a notification form to Ecology Inspection Engineer to inspect the Gravel when delivered on site, and attach with the form the following reports:
 - the gradation analysis
 - the constant head Permeability test
 - method of placement of gravel
- * Ecology Inspection Engineer will observe the Gravel placement operation for the following:
 - placement locations relevant to specifications.
 - thickness of layer placed
 - condition of aggregate.

3.6.2

HDPE PIPING (ref CQA Plan 4.5.2.1)

- * CQA Officer/personnel will submit to Ecology a notification form prior to starting assembling the High-Density Polyethylene Piping, with Certified Material Test Reports for the piping material to be used, to review, check, and observe the following:
 - proper placement and alignment
 - pipe and pipe fittings jointing
 - performance pipe testing
 - backfilling and compaction after installation

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3.7 Mechanical and Electrical Systems (ref CQA Plan 4.8,4.9,4.10)

3.7.1 General Preconstruction Data

3.7.1.1 Mechanical Fittings and Installations

CQA Officer/personnel will submit the documentation mentioned in the above reference concerning:

- manufacturers' catalogs and components data
- installation instructions
- installation, operation, and maintenance manuals for pumps and control valves

3.7.1.2 Electrical Instrumentation

CQA Officer/personnel will submit the documentation mentioned in the above reference to the Ecology Inspection Engineer for:

- Leak sensors
- level detectors
- transformers and cable

3.7.2 Inspection During Construction

3.6.2.1 Mechanical Works

Ecology Inspection Engineer will observe all piping and pipe fittings installations which shall be carried out in accordance with the approved drawings and specifications. After completion of all installation works, CQA Officer/personnel will submit to Ecology Inspection Engineer a notification form for the final operation and visual tests, prior to final Tie-In stage.

3.6.2.2 Electrical Works (ref CQA Plan 2.3.7.2.2)

Ecology Inspection Engineer will observe all wiring and electrical fittings installations which shall be carried out in accordance with the approved drawings and specifications. After completion of all installation works, CQA Officer/personnel will submit to Ecology Inspection Engineer a notification form for the final operation and visual tests, prior to final Tie-In stage.

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4.0 INSPECTION FORMS AND PROCEDURES

4.1 The following is a description of the forms which will be used to expedite the inspection procedures carried out by both Ecology Inspection Engineer and the Project CQA Officer. The main aim behind using these forms is to record the site activities inspection and observation for all parties' present and future reference.

4.2 Activity Notification Form (sample form attached)
This form will be filled and submitted by the CQA Officer/personnel before commencing new activities. This form is, practically, a notification to the Ecology Inspection Engineers concerning an activity which is ready to be commenced by the contractors, so as he/she (Ecology Inspection Engineer) can check site works, approve the progress of the construction, and observe the execution of the works.

4.3 Construction Site Note (sample form attached)
This is a site notification form issued by Ecology Inspection Engineer to CQA Officer's site staff in response to one of the following cases:

- non-conformance with general safety regulations
- non-conformance with either specifications or drawings and refusing to rectify conditions.
- starting an activity before receiving the Notification form from the CQA Officer.

4.4 Attachments
ACTIVITY NOTIFICATION FORM
CONSTRUCTION SITE NOTE

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

ACTIVITY NOTIFICATION FORM

PROJECT :

LOCATION:

SUBMITTED ON:

RECEIVED ON:

AT: _____

BY

AT: _____

BY:

DESCRIPTION OF ACTIVITY

PLANNED DATE AND TIME FOR ACTIVITY TO START: _____

☐ CONCRETE CASTING

☐ SOIL PLACEMENT

☐ OTHERS

☐ SURVEY
☐ FORMWORK
☐ STL. REINF
☐ SERVICES

☐ SURVEY
☐ COMPACTION
☐ MATERIALS
☐ MEMBRANES

YOU CAN/CANNOT PROCEED WITH/WITHOUT OBSERVING THESE NOTES:

1. _____
2. _____

CHECKED BY: _____

DATE:

RECEIVED BY: _____

DATE: AM _____

PM _____



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
CONSTRUCTION SITE NOTE

DATE: _____ NOTE #: _____

PROJECT: _____

LOCATION: _____

ACTIVITY _____

NOTE:

REQUIRED ACTION:

SUBMITTED BY: _____ RECEIVED BY: _____

DATE: _____ AT: _____ DATE: _____ AT: _____

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Author

Addressee

Correspondence No.

J. J. Witczak, Ecology

C. E. Clark, RL

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PERMIT APPLICATION

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